

THE STATE OF SITE FORMATION RESEARCH IN THE MIDDLE ATLANTIC

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Introduction

Site formation, or the creation of the archaeological record, is a matter of fundamental importance in archaeological inquiry. How a site came to look as it does today is a function of the original cultural behaviors as well as an array of depositional and postdepositional processes. Michael Schiffer conducted pioneering research on formation processes, explicitly drawing a distinction between systemic and archaeological contexts. In his model, artifacts and facilities are used in various ways during their life history. Once items fall out and no longer participate in the systemic context, they end up in archaeological context. The reconstruction of human behavior is drawn from the archaeological context, or the three dimensional spatial patterning of artifacts, features and other debris. Three stages can be conceived in which material remains become incorporated into the archaeological record. The first stage is site occupation, where human behavior leads to the creation of cultural patterns. This may consist of single or multiple activities of variable intensity and duration, and it may involve one or more occupations on the same surface. At the time a site is occupied and until it is recovered by archaeologists, material remains become incorporated into the deposit. Depending on depositional context and processes, occupations may always remain on the surface or they may become slowly or quickly buried. A variety of postdepositional processes, including geological, chemical, and biological agents, may selectively preserve and pattern cultural materials. From this record, archaeologists excavate a sample of the site, and recover materials in context. Importantly, investigators should expect that certain behavioral and natural processes lead to regular and patterned residues in archaeological contexts. As a result, archaeological patterns and their spatial arrangements are expected to be closely tied with specific activities and environmental and geomorphological contexts. Although archaeologists should expect regularized patterning, this is not to deny that the patterning can be quite complicated, the result of nuances of activity and local environmental conditions. Accurately determining behavior in these circumstances rests on the ability of the analyst to recognize contextual diversity and the specific cultural and natural processes which led to the creation of the stratigraphic record and its spatial arrangements.

The goal of this paper is to examine the formation of prehistoric sites located in the Mid-Atlantic region. Prehistoric sites in the Mid-Atlantic are located in specific depositional contexts and exhibit certain archaeological patterns. It should follow that each archaeological site and depositional environment provides a distinct set of problems in site formation analysis. If this argument is accepted, a logical conclusion is that site formation is extremely important in assessments of prehistoric settlement, subsistence, and technology.

Research in the Region to Date

Before assessing formation processes on a particular set of sites, it is useful to examine the degree to which archaeologists have paid attention to site formation in the Mid-Atlantic. To obtain an impression of how much research is expended on site formation, two major regional journals were systematically reviewed. Back issues of the *Archaeology of Eastern North America* and the

Journal of Middle Atlantic Archaeology were surveyed for articles concentrating on site formation. We examined articles to ascertain if they centered on geomorphology, geoarchaeology or the ways in which spatial patterns of the archaeological record were analyzed or formed. We only took note of articles which systematically addressed these issues, and do not account for those which simply mention site formation or site formation analyses. For the *Archaeology of Eastern North America* beginning in 1982 and the *Journal of Middle Atlantic Archaeology* beginning in 1985 there were a total of 235 articles. Of these, about 70 were site reports or site based analyses and about 100 were regional surveys or articles dealing with trends across more than one site. A total of 15 articles contained material directly assessing site formation. There are several thematic or “state of the art” issues, none of which address formation analysis with more than a passing mention.

Of the fifteen articles which discuss site formation, the most common aspect of formation analysis addressed is artifact refitting, used to establish stratigraphic or depositional integrity. A larger number of articles do mention site formation, indicating an awareness of the issue, but often the issue is not dealt with in the analysis. There are several treatments of geomorphology and sediment analysis as it applies to deposition and preservation. There are specific case studies on the mechanics of artifact movements in soil profiles and on the depositional and postdepositional ramifications of insect remains in burials. In several articles, there are general statements on the effects of scavenging, pit feature formation, postdepositional artifact displacement, and faunal bias preservation.

For the most part, treatments of stratigraphy, site structure, and geomorphology are descriptive and often perfunctory or mechanical, with little or no consideration of development or interrelationships. Geomorphological data are used to assess environmental associations, actually controlling for site formation and preservation factors. It would probably not be surprising to find that most archaeologists assume that they are cognizant of site formation and pay attention to or analyze site formation processes as a matter of course, but not explicitly. Being aware of context is basic to archaeological research and interpretation. This may in fact be true to a large extent, but the approach needs to be made more explicit. There is much more to site formation analysis than simply saying that stratigraphy is intact, the site lies on a terrace, or there are rodent burrows at the site.

The Middle Atlantic Region

The physiographic provinces of Eastern North America may be a useful way to characterize and examine site formation. For the Middle Atlantic regions, these consist of the Appalachian Plateau, the Ridge and Valley, the Piedmont and the Coastal Plain. Climatic factors and edaphic factors, or slope, soils, surface water and exposure, determine biotic environmental composition.

Archaeologists have explicitly and implicitly embraced the physiographic models of landscape and environmental variability to understand prehistoric subsistence strategies, settlement patterns, and technology. Gardner’s idealized transects across physiographic zones are perhaps the best known regional examples of this practice. In this paper, we have adopted the same approach as an organizing principle. It should be anticipated that each physiographic province will provide its own gross site formation characteristics, although each province will be cross cut by geomorphological zones, such as hillcrests, slopes, floodplains, and terraces.

Study of Formation Processes in the Region--The Transect Approach

We examine five archaeological sites in three major physiographic zones, two in the Appalachian Plateau, two in the Piedmont, and one in the Coastal Plain. We have chosen these sites since they have undergone extensive analysis and they are considered to be representative of a class of sites in each of these regions. Within each province, we examine the relationship between geomorphology, soils, and the vertical and horizontal distributions of artifacts and features. To place as many controls as possible on this study, we have selected sites of certain ages and types so that site formation comparisons can be made. In the selected cases, we chose Late Archaic sites, dating to from approximately 3000 to 500 B.C. Selection of sites no older than five thousand years limits the range of environmental processes acting on the sites. In addition, each of the sites chosen is an example of a relatively short term, special activity or specialized procurement site, as opposed to a continually occupied, sedentary village locale.

Two sites were chosen from the Unglaciaded Appalachian Plateau of Pennsylvania, the Connoquenessing site and the Kettle Creek site. The Appalachian Plateau is characterized by relatively flat lying strata which are broken only by small faults and low, broad folds. The topography ranges from deep-sided, narrow stream valleys to uniform low, rolling hills. There is a dendritic drainage pattern corresponding to the dissected plateau surface. The area is wet and cool with humid oak-chestnut forests. The soils are generally acidic and on floodplains they are generally unconsolidated, heterogeneous mixture of recently deposited clay, silt and gravel from reworked Pleistocene gravels from glacial outwash.

The Connoquenessing site is at an elevation of 868 feet above mean sea level on a low terrace above Connoquenessing Creek. The perennial creek is a tributary of the Beaver River, which drains into the Ohio River. The site is situated in a relatively wide valley with broad, gently sloping terraces. The terrace consists of a thin mantle of Holocene alluvium overlying Pleistocene age alluvial sediments, thus sediment aggradation was minimal. Cultural stratigraphy was limited to the plow-zone surface layer. Artifacts in the plow zone were few, with a mean count of 10 artifacts per one meter unit. As a result, there was no spatial clustering of artifacts. There were few features, and of the ones that survived, these consisted of pits that penetrated the sterile subsoil. The Late Archaic features consisted of pits with in situ burning overlain by fill, and basin shaped pits containing fill resulting from refuse disposal or post abandonment processes. The relative similarity in size and depth of the features suggested that the original ground surface had not varied significantly during the site occupation. The overall density and distribution of artifacts and features suggested the probability of multiple, relatively closely spaced, but non-intensive occupations. Given that occupations occurred on the same surface, with little sediment aggradation, the potential was good for the merging of discrete artifact patterns from separate occupations.

The Kettle Creek site lays at a similar elevation as the Connoquenessing site, approximately 872 feet above mean sea level. The site is located on the floodplain of Kettle Creek, a perennial stream flowing through a dissected valley toward the West Branch of the Susquehanna River. Late Archaic period occupations were identified on the western and eastern sides of the stream. On the west side, alluvial aggradation of silts and sands produced deep and stratified cultural deposition. Extensive and well-developed soil horizons were present within the profile. Stratigraphic separations and radiocarbon dates established several reoccupations during the Late

Archaic. Late Archaic occupation consisted of an intact surface with high artifact density and spatial distributions indicative of human activity. One soil horizon contained scattered heated rocks and artifacts. While sediment aggradation led to preservation of cultural levels, there were stratigraphic signs for overprinting of Late Archaic occupations and postdepositional vertical transformation as indicated by artifact density and refits. The remnant and scattered fire cracked rock features may represent disassembled hearths from postdepositional disturbances. The loss of organics in this situation may also signal postoccupational deteriorations. On the east side of Kettle Creek, the valley was broad and wide. An initial phase of Late Archaic occupation was followed by lateral stream migration, producing cut and fill sequences, and new sediment aggradation in places. As a result, cultural stratification was horizontal, with Late Archaic period material below the shallow sediment mantle, or the plowzone. High ground resulting from sedimentation in one place contained artifacts and a series of shallow and highly organic pit features. Multiple reoccupations in this area during the Late Archaic was evident by spatial distributions and the temporal range of radiocarbon dates. While features could be discerned, repeated occupations in the same area tended to produce spatial overlap among features and a dense accumulation of surrounding anthropogenic material which could not be separated by particular occupation.

Two sites are located in the northern Virginia Piedmont, the Cedar Run site and the Cedar Creek site. The Piedmont is characterized by low relief and rolling, hilly plains. Most of the surface water occurs as low order drainages which have small floodplain swamps and bogs. The Northern Virginia Piedmont drainages empty into the Potomac River, the major regional drainage. The surface soil in this zone is the result of weathering of sedimentary rocks. Residual alluvial gravel deposits are common throughout the area. The region is characterized by an oak-hickory-chestnut forest cover.

The Cedar Run site is situated at about 200 feet above mean sea level. The site sits on an upland ridge above Cedar Run, a perennial stream flowing through a dissected valley. Sedimentation from overbanking of Cedar Run was not possible in this elevated context, the sediments composed of weathered bedrock residuum and contributions by a combination of processes including sheetwash from higher ridges and aeolian and colluvial processes. Cultural deposition in this context was shallow, confined to the plow zone. The number and variety of Late Archaic projectile points and artifacts implied multiple reoccupations over a large area. The shallowness of the deposits and the proximity of bedrock was not conducive for feature preservation. No patterning in the horizontal and vertical distribution of artifacts was viewed in this context.

The Cedar Creek site lay at an elevation of approximately 195 feet above mean sea level. Evidence of Late Archaic occupation occurred on a terrace adjacent to the creek, which is a low order, spring fed stream. Like the Cedar Run site, in most places, bedrock was close to the surface, thus artifacts were contained in shallow deposits. In other places, bedrock was deeper, allowing for stratigraphic development. Cultural deposits reached up to 1 meter, the result of colluvial and sheetwash processes from more elevated contexts and alluvial deposition from Cedar Creek. The profile was mainly made up of a silt loam, containing weakly developed or incipient soils. The deposit was visually undifferentiated with no laminations or other variations in soil color or texture. Artifact counts and density was high throughout the profile. Concentrations of fire cracked rock were identified, although no charcoal or darkened or reddened soil was encountered. The large amount of artifactual material and the wide range of artifacts and projectile points suggested extensive or repeated site use. Integrity of the profile was established by the

presence of the features and the general chronological ordering of projectile points through the vertical profile. However, the effects of slow burial rates between Late Archaic occupations and postdepositional disturbances were also apparent. The vertical range of projectile points was mixed somewhat, indicating that no individual temporal components could be isolated. The general horizontal artifact distribution indicated the presence of clusters of material, remnants of activity areas. While these remnant areas could be identified, no contemporaneity could be proven, and blending of artifact distributions in the same level may be a sign of cultural or natural overprinting. The blending of the sediment profile and some sorting of artifacts vertically indicated that postdepositional processes acted on the site, probably biological agents as evidenced by root casts and worm and insect burrowing. However, these postdepositional transformations were not great enough to alter all vertical and horizontal patterns or move larger clasts, as demonstrated by feature integrity. The lack of organics in the levels and features may signal chemical deterioration and blending of soils by natural agents.

The Lums Pond site lies in the High Coastal Plain of Delaware. The Coastal Plain is characterized by low and level relief, made up of Pleistocene sands and gravels, with considerable expanses of poorly drained swamps and marshes along streams, with well drained soils along their terraces and floodplains. The Lums Pond site is at an elevation of 50 to 75 feet above mean sea level along the upper and lower terraces of a low order stream that flows to St. Georges Creek, which in turn, flows into the Chesapeake Bay. Late Archaic occupations occurred on two separate landforms, a sloping terrace above the stream and on the floodplain itself. Upper terrace areas consisted of plow-disturbed silt loam or recent aeolian sediments overlying undisturbed sandy Pleistocene outwash deposits. In this context, most artifact patterns were blended as a result of low natural sediment aggradation and erosion, and repeated activity in one location. Although most patterning was blended, these deposits indicated that some activity areas, such as lithic reduction areas, were preserved as a consequence of singular activity and lack of repeated deposition of cultural material. A series of pits were excavated into the sandy subsoils. The pits contained organics and artifacts, together with tightly clustered radiocarbon dates. The non overlapping pits, their tight absolute dates, and their consistent material patterning indicated short term use and relatively rapid infilling. The sandy substrate also preserved enigmatic features, which also contained occasional artifacts and charcoal flecking, the result of some combination of natural and cultural processes. A second part of the site was situated on the floodplain of the creek where stratified deposits up to a meter in depth were recovered. The sediments were derived from overbank flooding, consisting of silt loam deposit, with soil development and a highly organic layer. The levels contained a moderate number and density of artifacts. In one level, a disassembled hearth was evident and spatial clustering of artifacts was also observed indicative of depositional integrity. While cultural patterning in this level could be identified, artifact contemporaneity could not be demonstrated. Refitting indicated vertical transformations of artifacts by postdepositional processes by as much as 20 cms upwards and downwards. The stratigraphically ordered, but temporally divergent radiocarbon results indicated the potential for mixing as well.

Discussion

The question now arises as to whether there is a relationship between site formation and physiographic province. We suggest that there is a general relationship, although this relationship is complex and not easily discernible owing to the geomorphic variability in each province.

An interesting comparison can be made between the archaeological deposits on upland contexts of the three provinces. In general, the site-wide comparison indicates that we should expect that there are more shallow stratigraphies in the Appalachian Plateau and the northern Virginia Piedmont. The Connoquenessing site in the Appalachian Plateau and the Cedar Run site in the Piedmont, tend to be characterized by shallow stratigraphies with slower rates of deposition over erosion. In this situation, soils do not easily develop and repeated occupation would occur on a thin sediment matrix. If repeated occupations occurred in these areas, archaeological patterns would thus be overlapping and discrete activities would be difficult to establish from artifact distributions. A main difference between the two contexts was in their substrates, resulting in variable feature preservation. In the Appalachian Plateau context, feature preservation was possible as a result of an unconsolidated subsoil matrix that allowed the excavation of hearths at the Connoquenessing site. In contrast, at the Cedar Run site, bedrock was at or near the surface, resulting in no possibility for preservation of features. The upland situation on the Coastal Plain appeared to contain more deposition over erosion, allowing for the development of soils. Archaeological patterns there may indicate single activities or activity sets from one occupation. However, since deposition was not very rapid, repeated occupation of the same surface also occurred, resulting in mixed assemblages from reoccupations. In the Coastal Plain, sediments often consist of sandy substrates, thus allowing for the excavation of pits. Organics survived in this case because of evidence for fairly rapid infilling. However, in other situations, organics may not survive, either due to destruction as a result of slow burial or water filtration through the sandy sediments. In such a sandy matrix, preservation of disturbances caused by non-anthropogenic agents would also be expected, leading to queries about the natural or cultural origin of certain features.

Comparison of lowland or floodplain situations in the three physiographic provinces likewise indicates variability with regard to site formation. The floodplains and low terraces of streams in the Appalachian Plateau, the Piedmont, and the Coastal Plain all contained buried stratigraphy. At Kettle Creek West, the Cedar Creek site, and the Lums Pond site, soil development was present, with definable artifact distributions associated with Late Archaic surfaces. Thus relatively rapid alluvial deposition sealed artifacts and features. While Late Archaic surfaces were buried, there was evidence for some degree of overprinting and postdepositional processes, although the magnitude of these processes was greatest in the Piedmont situation. In Kettle Creek West and the Lums Pond site, organic soil horizons, features, and artifact patterning were recognizable, but there was evidence that the cultural levels may represent accumulations of separate occupations or merged activity sets during one occupation. In addition, stratigraphic evidence indicated that there was movement of material through levels, thus causing some alterations in artifact patterns. The Cedar Creek site also contained a definable, but diffuse Late Archaic horizon. However, postdepositional processes had homogenized the stratigraphic profile, destroying evidence of soils, organic horizons, and organics associated with features. In the Appalachian Plateau region, where floodplains tend to be wide and stream courses meandering, there was also evidence for little sediment deposition, with instances of erosion and site destruction. Little sediment accumulation was apparent on the wide floodplain of the Connoquenessing site, especially as distance increased away from the river channel. Site alteration was especially apparent in the Kettle Creek East site where stream erosion led to destruction of archaeological deposits.

Conclusion

In conclusion, this paper has attempted to make a case for paying explicit attention to the formation of the archaeological record in the Middle Atlantic region. We have suggested that archaeologists must make a concerted and explicit effort to examine the role of cultural and natural processes in forming the archaeological patterns they are attempting to interpret. We have examined site formation from the perspective of the variable preservation conditions in three physiographic provinces, showing that formation processes are related to the particular geomorphic circumstances in each province. It is clear that rate of deposition and the intensity of cultural occupations clearly influences the organization of site patterning. These factors may be predicted from prior knowledge of the geomorphological conditions present, affording an initial assessment of site integrity and providing preliminary guidelines for subsequent analyses. This type of analysis needs to be formalized, and explicitly carried out as the first step in any archaeological investigation. Therefore we would argue that site formation studies are a necessary and fundamental element in an examination of any particular element in Middle Atlantic archaeology. In published articles and in many archaeological projects in the Mid Atlantic, there are instances where formation issues are addressed. However, the issues are not part of a comprehensive research design, informing the rest of the analyses and interpretations. Thus, site formation analysis is important at all levels of the study of prehistory, whether in choosing predictive survey models, in site significance evaluation, or in data recovery sampling. Hopefully, archaeologists will integrate site formation studies in their research designs in the future, informing the analyst about the processes leading to observed spatial configurations and preservation conditions.